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Testimony of Christopher O'Brien

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Sharp Electronics Corporation, Solar Energy Solutions Group
Chairman, Solar Energy Industries Association

Before the United States House of Representatives
Committee on Transportation and Infrastructure
May 16, 2007

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Thank you, Mr. Chairman and Members of the Committee, for providing me the opportunity to testify today.

My name is Christopher O'Brien. I am Vice President for Strategy and Government Relations for Sharp Electronics Corporation's Solar Energy Solutions Group, and I also serve as the Chairman of the Board of the Solar Energy Industries Association (SEIA). It is in my role as Chairman of SEIA that I appear before you today.

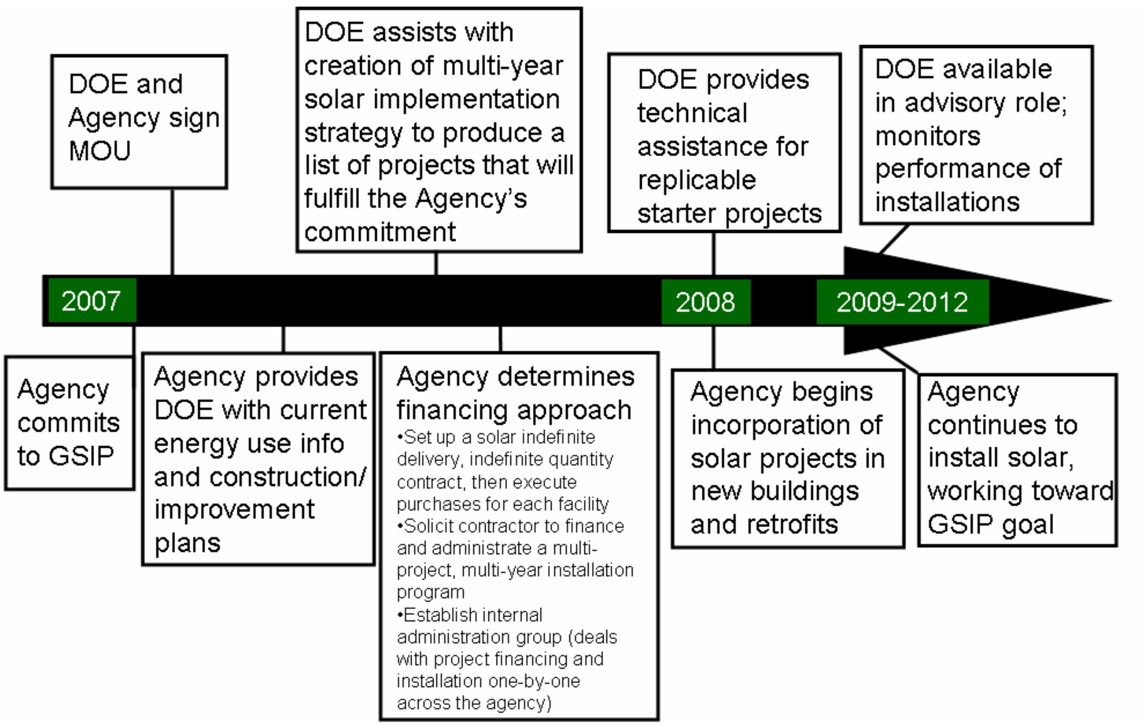
Before turning to SEIA's recommendations on policies that will encourage increased usage of solar energy at Federal facilities, let me first emphasize that the single most important action that the Federal government can take to encourage increased use of solar energy across the country would be to enact the provisions of S590 / HR 550, the Securing America's Energy Independence Act, which includes an eight-year extension of the solar investment tax credit (ITC) for homeowners and businesses who install solar energy systems. The long-term Federal commitment of the ITC extension is crucial to establish parity between congressional support for other electricity generation technologies and solar energy. Parity constitutes equal treatment – not special treatment. An eight-year extension of the ITC will create significant benefits that are not possible through more frequent, shorter term extensions of favorable tax treatment. Solar energy improves our energy independence, energy security and environment, and it deserves long-term, stable congressional support now. Further information on this important legislation is included in Appendix 2 of my written testimony.

Let me now turn to the matter at hand before this Committee, and outline SEIA's recommendations for specific policies to encourage increased deployment of solar energy systems at Federal facilities.

SEIA recommends the creation of a new strategic initiative, the Solar Technology Utilization and Deployment Program (Solar Program). The Solar Program would create a program for Federal, State and local governments that facilitates the installation of solar energy systems, including solar thermal, and expedites the purchase of solar-generated electricity via third party financing. The target would be to achieve 3GW of mandated installed solar capacity at Federal facilities by 2012, and would be complimented by voluntary commitments from state and local governments.

Federal commitments would be established in 2007 and 2008. Agency requirements to deploy solar would be calibrated to their energy consumption: The more an agency spends annually on energy, the more solar it would deploy. It is crucial to recognize that the capital expenditures for these projects would be borne by private financial markets using creative third party financing tools made possible by a long-term extension of the existing solar ITC (HR 550).

An example of a Solar Program project implementation timeline is shown below:



There is a strong policy rationale for the Federal Government to take the lead in launching the Solar Program. The Federal government is the largest single user of energy (1.4% of U.S. energy use); the Solar Program would provide an opportunity to lead by example. The Solar Program would also have a significant impact in stimulating market and jobs growth. Solar companies will grow rapidly to supply a sustained government demand. The Federal Government has the stability to act as a market foundation while adopting a technology shift to solar, and to enter into long term 30 year contracts, which will greatly accelerate the financeability of solar energy projects. Finally, the Solar Program as outlined above would displace roughly 3 million metric tons (MT) per year of CO2 emissions as a result of achieving the target of 3GW of installations.

In order to launch and implement the Solar Program, the following legislative changes and actions would be required:

1. Federal statute (40 U.S.C. 501) currently restricts GSA from entering into utility contracts with a duration greater than 10 years. The Solar Program would require legislation to amend 40 U.S.C. 501 to provide GSA an exemption from this 10-

year restriction for any utility service contract that supplies energy from new renewable resources. This is necessary because most private-sector PV installations will pay out over 10-30 years, so the utility service contract must cover that duration.

2. Authorize Federal agencies to offer a ground lease of underutilized real property (rooftops, underutilized land areas) to solar energy service companies (ESCOs) for on-site power production.

3. Enact legislative language setting required metrics for use of solar power in Federal facilities (e.g. at 2GW for Federal Agencies). Top-down guidance to the responsible agency head to the facilities staff responsible for energy procurement and utility decisions would facilitate broader solar energy use across Federal facilities – this could be administered via GSA or OMB.

4. Pending enactment of the above, Congress should demonstrate its leadership and commitment to solar use and deployment by immediately requiring the Architect of the Capitol to issue a request for proposals to deploy 5 MW of solar on Congressionally controlled property and structures. This immediate-term solar deployment would demonstrate that Congressional Leadership is sincere in its quest to usher in a carbon-smart future and set a powerful example.

Conclusion

The Federal Government must play a critical role in increasing the usage and installation of solar energy systems across the U.S. In addition to the broad solar market growth that will result from the enactment of HR550 / S590, an 8-year extension of the investment tax credit for solar energy systems, SEIA recommends that the Federal Government enact a new initiative to accelerate the installation of solar energy systems on Federal facilities. The Solar Program would provide a significant stimulus to the national market for solar energy systems, and would provide a high-profile opportunity for the Federal government to lead by example in adopting solar energy as a significant portion of the overall energy mix.

Thank you for the opportunity to comment today. I look forward to addressing any questions that you have.

APPENDIX 1 – OVERVIEW OF SOLAR ENERGY TECHNOLOGIES

Photovoltaics (PV)

Technology

Photovoltaic (PV) devices generate electricity directly from sunlight via an electric process that occurs naturally in certain types of material. Groups of PV cells are configured into modules and arrays, which can be used to power any number of electrical loads.

Crystalline silicon - the same material commonly used by the semiconductor industry - is the material used in 94% of all PV modules today. PV modules generate direct current (DC) electricity. For residential use, the current is then fed through an inverter to produce alternating current (AC) electricity that can power the home's appliances.

The majority of PV systems today are installed on homes and businesses that remain connected to the electric grid. Consumers use their grid-connected PV system to supply some of the power they need and use utility-generated power when their power usage exceeds the PV system output (e.g., at night). In 41 US states, when the owner of a grid-connected PV system uses less power than their PV system creates, they can sell the electricity back to their local utility, watch their meter spin backwards, and receive a credit on their electric bill - a process called **net metering.** The electric grid thus serves as a "storage device" for PV-generated power.

Markets

The global PV market has averaged 38% annual growth over the last five years. Yet PV still accounts for a small percentage of electricity generation worldwide and less than 1/30th of 1% in the US. Furthermore, the US lags behind Germany and Japan in installations as well as in manufacturing. Germany and Japan have surged to the lead with coherent, long-term national incentive policies, despite dramatically inferior amounts of sunshine.

The US possesses the best solar resources in the world, and yet Germany installs **seven-times as much PV as the US**. Germany and Japan have taken the lead in solar manufacturing and installations because of long-term national incentive policies designed to make solar power mainstream. Japan instituted a carefully designed rebate program that lasted over ten years, while Germany incentivizes solar installations by paying 3–4 times retail electric rates for the electricity generated from PV systems for 20 years. The surging player in the industry, China, has gone from having no PV industry to manufacturing twice the level of the US in just three years.

While California is the dominant US market for PV, with 73% of the grid-tied installations in 2006, other states now offer modest PV incentives for consumers, including Massachusetts, Connecticut, Illinois, New York, Oregon, Wisconsin and Washington State. California, Texas and Pennsylvania have long-term policy commitments to develop solar in-state. Major PV manufacturing expansions have occurred in some of the states hardest hit by the outsourcing of US jobs, including California, Washington State, Oregon, Michigan, and Massachusetts.

Concentrating Solar Power

Technology

Concentrating solar power (CSP) plants are utility-scale generators that produce electricity by using mirrors or lenses to efficiently concentrate the sun's energy. Two principal CSP technologies are parabolic troughs and dish-Stirling engine systems.

Using curved mirrors, **parabolic trough** systems concentrate sunlight to drive conventional steam turbines. The mirrors focus the sun's energy onto a receiver pipe or heat collection element. From there, a high temperature heat transfer fluid picks up the thermal energy and uses the heat to make steam. The steam drives a conventional steam-Rankine power cycle to generate electricity. A typical collector field contains many parallel rows of troughs connected in series.

A parabolic trough plant in California's Mojave Desert.

A Stirling dish-engine system at Sandia National Labs.

A solar **dish-engine** system is shaped much like large satellite dishes and covered with curved mirrors. The dish is programmed to always face the sun and focus that energy on a receiver at the dish's focal point, in much the same way that a satellite dish focuses radio waves on a tuner. The receiver is connected to a Stirling engine, which uses the thermal power generated by the focused solar energy to heat liquid hydrogen in a closed-loop system. The expanding hydrogen gas creates a pressure wave on the pistons of the Stirling engine, which spins an electric motor, creating electricity. Individual dish-Stirling units range in size from 10 to 25 kW. With their high efficiency and modular construction, dish-engine systems are expected to be cost-competitive in distributed markets.

Markets

During the 1980s and early '90s, developers built nine concentrating solar power plants in California's Mojave Desert. Then, for nearly two decades, no new plants were built – due to the erosion of federal support for renewables and plummeting energy prices. Yet in the current climate of rising natural gas prices, water scarcity, air pollution and carbon management concerns, concentrating solar power has the potential to play a major role in meeting the Southwest's future energy needs.

The Western Governors' Association recently commissioned a Solar Task Force to report on the potential for clean solar development in the Southwest. The Solar Task Force

Report, adopted in July 2006, identified areas with a potential for CSP generation capacity of approximately 200 gigawatts (GW). This capacity could produce about 473,000 gigawatt hours (GWh) per year.

Solar Thermal Systems

Technology

Solar thermal systems provide environmentally friendly heat for household water and space heating. The systems collect the sun's energy to heat either air or a fluid. The air or fluid then transfers solar heat to your home or water. In many climates, a solar heating system can provide a very high percentage (50 to 75%) of domestic hot water energy. In many northern European countries, combined hot water and space heating systems are used to provide 15 to 25% of home heating energy.

Active solar water heating systems can be either "open loop," in which the water to be heated flows directly through the rooftop collector, or "closed loop," in which the collector is filled with an antifreeze solution that passes through a heat exchanger mounted in or around your normal water heater. During the day, in good weather, your water can be heated entirely by the sun. In any weather, the heating system can back up your existing heater, reducing overall energy costs.

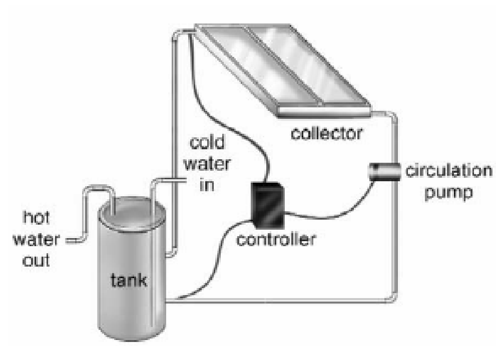


Diagram of an active solar thermal system.

Markets

An installer mounts a solar water heater flush to the roof.

In the absence of coherent national policies, from 1997 until 2005, the US solar water heating and solar space heating market showed little growth, averaging about 6,000 installations per year. In the past year, numerous states, including New York, Florida, Hawaii, and Illinois, have created or expanded incentives to complement the new federal tax credits. Accordingly, the market is projected to increase 25 to 50 percent in 2007.

On the manufacturing side, the past year has seen an influx of new entrants into the US market, and the introduction of new systems that use polymer-based collectors (as opposed to sheet metal). However, domestic manufacturers have stated that with a two-year window for the federal credit, they are unlikely to ramp up production substantially until a long-term market policy has been established.

APPENDIX 2 –

OVERVIEW OF SEIA'S RECOMMENDATIONS ON S590/HR550 – Excerpt from testimony of Rhone Resch, President of SEIA, before House Ways and Means Committee, May 2007

Recent Solar Tax Treatment History and Current Legislation

The Energy Policy Act of 2005 (EPAct 05) created a new commercial and residential ITC for fuel cells and solar energy systems placed in service from January 1, 2006 through December 31, 2007. The credit was further extended for one additional year in the Tax Relief and Health Care Act of 2006. The solar ITC now expires on December 31, 2008.

The new solar ITC is working and has helped more Americans use solar energy in their homes and businesses. However, the credit's limited size and duration has restricted manufacturing investment, failed to significantly increase the number of trained installers, which are critical to drive down future costs, and has not resulted in the construction of new utility-scale solar power plants. In response, Congressmen Michael McNulty (D-NY) and David Camp (R-MI) have introduced the *Securing America's Energy Independence Act* (HR 550) to improve and build upon the existing tax incentive.

The *Securing America's Energy Independence Act* provides a blueprint of the policy changes needed to secure a long-term robust solar marketplace in America. Specifically, the legislation:

- Extends the ITC for all residential and commercial solar and fuel cell equipment for eight additional years;
- Modifies the residential and commercial tax credit for photovoltaic cell technology (direct conversion of sunlight into electricity) to $1,500 per half kilowatt;
- Removes the 30% cap for commercial photovoltaic installations and the $2,000 cap on residential photovoltaic installations;
- Provides alternative minimum tax (AMT) relief; and,
- Provides three year accelerated depreciation for commercial projects.

The short and long-term benefits of enacting these changes would be significant. The benefits include:

- **Increased energy security:** Solar technologies help stabilize the nation's electricity grid, provide clean, reliable power, and reduce the impact of natural disasters and terrorist acts. Producing these home-grown technologies in the US will reduce our dependence on foreign sources of energy, while simultaneously lowering the cost of energy to consumers.
- **Reduction in the use of high cost natural gas:** In most parts of the US, peak electricity demand occurs when solar electricity is near optimal efficiency (9 AM – 6

PM). This demand load is almost exclusively served by central station gas generation that can be easily cycled on and off and is often highly inefficient. An eight-year extension of the ITC will displace over 5.5 trillion cubic feet (Tcf) of natural gas and save consumers over $50 billion.

- **Job creation:** Solar systems require high-tech manufacturing facilities and produce well paying, high-quality jobs. Extending the tax credit will create an estimated 55,000 new jobs in the solar industry and over $45 billion in economic investment.
- **Clean energy:** Solar energy is the cleanest of all renewable energy sources, producing electric and thermal energy with zero emissions, no waste products or other forms of pollution.[1]

The Crucial Nature of the Eight-year Extension

It is critical that the extension of the ITC be for at least eight years, as provided for in HR 550. An eight-year extension will provide the long-term market "demand-signal" that is needed for industry to build new manufacturing capacity, expand the installer work force, and construct new utility-scale solar power plants.

Similar to other emerging energy technologies such as clean coal and new generation nuclear, utility-scale concentrating solar power (CSP) plants and new solar cell manufacturing plants require long lead times that far exceed the two-year time period remaining under EPAct 05 and the Tax Relief and Health Care Act of 2006. Development of a CSP plant can take six years, while new photovoltaic cell manufacturing facilities often require four years to be completed.

Additionally, solar energy is unique from other renewable technologies because it is installed on rooftops and requires an entire workforce of skilled electrical workers, plumbers, roofers, and others to be trained and certified to install solar systems. The creation of an entirely new specialized workforce requires substantial time and expenditure by the industry that will not occur without a long-term extension and improvement of the tax credit.

Long-term regulatory and tax treatment certainty is equally important to project financing. Solar energy power plant projects are more complex than conventional power plants because of the unfamiliarity of the lending industry with the technology. On average, financing can take an additional 12 months for project development. Political and therefore market certainty – in the form of an eight-year ITC – is needed to help reduce the cost of capital for these projects.

Despite the unique needs of the solar energy industry for long-term certainty, concerns have been raised that federal budget constraints may prevent long-term extension of the solar ITC. Similarly, some have argued that all renewable technologies, without regard to past treatment or current differences, should receive the same length of tax credit extension.

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[1] For a comprehensive description of the three commercial solar technologies see appendix

According to this argument, some maintain that it would be unfair to provide solar technologies with a longer duration credit extension than that accorded to other electricity generation technologies. This concern misses the mark. An eight-year credit extension for solar would approximate equal treatment and does not equate to special treatment. This is so for several reasons.

First, in EPAct 05 clean coal technologies were granted favorable tax treatment for ten years and new generation nuclear technologies were provided eight years. Wind energy technologies were also initially granted an eight-year duration (1992-2000) when the Internal Revenue Code §45 production tax credit (PTC) was created. These long-term extensions were an explicit recognition of the fact that emerging technologies need financial, regulatory and market certainty that is only afforded by long-term, consistent federal tax credit policy. Solar energy should be afforded equal treatment.

Secondly, energy technologies with more mature markets are governed by the production tax credit (PTC) provisions in Code §45 (e.g. wind, geothermal, hydropower), while renewable technologies with less developed markets (e.g. solar and fuel cells) are governed by the ITC provisions in Code §48 (commercial) and §25 (residential). Due to these differences in market maturity, it is even more critical to provide long-term incentives to the ITC technologies. Long-term support will encourage market expansion to the level enjoyed by the PTC technologies.

It is also important to recognize that the PTC and the ITC mechanisms function in fundamentally different ways and should not be viewed identically. As a practical matter, a one-year extension of the PTC is tantamount to a ten-year extension of the ITC. For instance, if the §45 PTC is renewed for one year, the duration of the favorable tax treatment is actually 10 years. This is because the “one year extension” for the §45 PTC actually refers to the duration of the “placed-in-service” rule governing the credit, not the actual temporal duration of the credit’s availability. Accordingly, under a one year §45 PTC extension, a claimant has one year to place qualifying §45 property (e.g. geothermal, hydro, wind, etc.) “in-service” to trigger an annual, recurring tax credit that lasts for ten years.

In contrast, the §48 ITC (or alternatively the §25 ITC) is a one-time credit for a portion of the cost of installing a qualifying solar system. The “claiming” of the §48 ITC credit ***does not*** trigger annual tax credit eligibility in each of the succeeding ten years. This distinction in the practical operation of the two different credits is fundamental. Furthermore, financial markets place a special premium on long-duration favorable tax treatment.

To the extent that the metric of Congressional fairness to varying technologies is tax extensions of equal duration, then the differences in the mechanics of the §45 PTC and the §48 ITC cannot be overlooked. To do so would fundamentally disadvantage solar energy technologies vis-à-vis competing electricity generation technologies. There is no sound public policy rationale for this lesser and disparate treatment.

The conclusion then, is clear. The ITC for solar energy and fuel cell assets should be extended for eight-years without regard to the length of extensions that are accorded other renewable energy assets. This is especially so given the history of favorable tax treatment that has already been afforded to coal, nuclear, ethanol, wind and other technologies.

An Eight-Year Extension of the Solar ITC Creates Unique Benefits

The value of an eight-year extension of the solar ITC cannot be equated with more frequent credit renewals of lesser duration. Four successive extensions of two-year durations each will not allow the US to construct new utility-scale CSP plants, reinvigorate our solar manufacturing base and pave the way for significant expansion and work-force training in the solar system design and installation industry. Only through a single, eight-year extension can the US solar energy industry realize its full potential. Nothing better illustrates this point than the graph below in Figure 1.

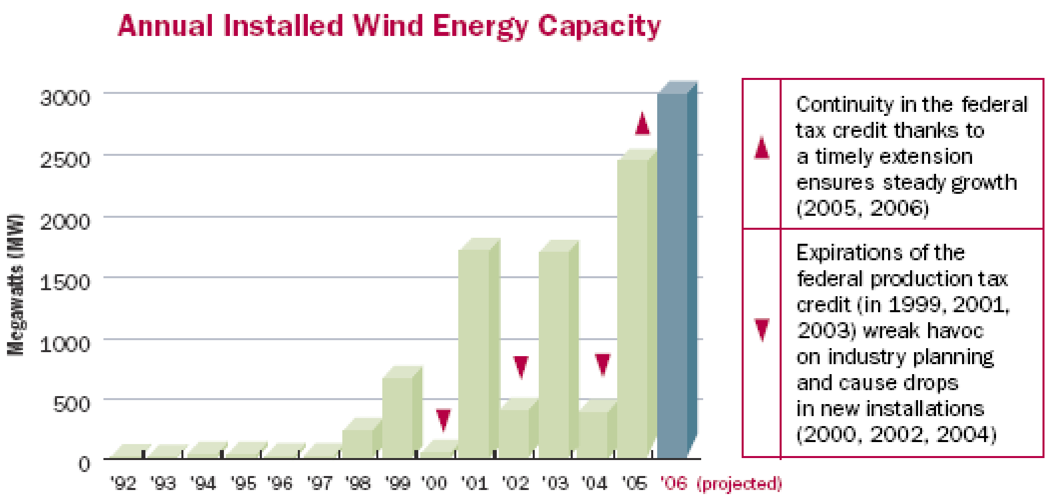

Figure 1: Source: AWEA, Wind Power Outlook 2006

As the chart in Figure 1 demonstrates, short duration, frequent renewals of credit extensions create a "boom-and-bust" cycle that will not favor the longer term development of a robust, national solar energy industry that maximizes the potential of our world-class solar resources.

Accordingly, it is essential that the extension of the ITC be for at least eight years. Such an extension will provide the long-term market demand signal that solar energy needs to transition from a nascent market to a mature one. Congress must eliminate the stop-start incentive cycle and create market conditions that allow solar companies to make new long-term investments that will reduce costs. To date, Congress has provided two short-term extensions (two and one year, respectively) that have not provided sufficient policy certainty for businesses to make long-term decisions.

An eight-year extension is especially critical for the development of large, utility scale (e.g. 500 megawatts) solar power plants. CSP plants (also referred to as solar thermal electric power plants) are large projects that often take six years to complete from the initial planning stages. In this regard, CSP plants face many of the same challenges that other, state-of-the-art power plant designs such as new-generation nuclear plants and “clean coal” power plants confront. In fact, Congress in EPAct 05 recognized the unique challenges facing “clean coal” and new nuclear power plants when it provided ten-year and eight-year duration favorable tax credit authorizations for these technologies, respectively. Congress should accord CSP plants similar treatment.

An eight-year extension is also crucial to reinvigorating the US solar manufacturing base. Because of the capital intensive nature of solar energy hardware production, new US manufacturing facilities will not be constructed unless there is business and investor confidence that the US marketplace will experience a long, steady and robust demand cycle for solar energy products. This need for a strong “demand signal” to spur domestic manufacturing applies equally to the solar thermal (water heating), the CSP, and the photovoltaic segments of the US solar manufacturing base. This point also applies with equal vigor to the entire “solar value chain” that includes research, engineering, polysilicon manufacturing, plastics manufacturing, glass production, copper wire drawing, metal fabrication, instrument manufacturing and battery production, among others.

Finally, an eight-year “demand-signal” is also necessary if the US is going to grow the installer base necessary to sustain robust deployment of solar technology. In order to expand the domestic market for solar energy, a significant number of electricians, plumbers, roofers and designers need to be trained and certified. Yet solar design and installation firms are unable to hire new personnel and bear the expense of training unless it is clear that the US solar market is in a period of long-term sustained activity and growth. Passage of HR 550 will provide the long-term financial, regulatory and business certainty that business owners require to commit significant new capital for workforce training and expansion.

Improvement of the Existing ITC will Maximize Efficiency and Cost Reductions

Passage of the *Securing America’s Energy Independence Act*, HR 550, will improve the current structure of the credit for photovoltaic (PV) (for more information see appendix) installations from 30% of the cost of the installed system to $1,500/half kilowatt, based on the nameplate capacity of the system. This modification would mimic the current structure for fuel cells. This change improves the credit by converting it from a cost-basis to a capacity-basis, thereby rewarding greater capacity, not greater costs.

There are several reasons for the PV credit to be modified to a capacity-based incentive. First, capacity-based incentives encourage cost efficiency and expedite the reduction of the cost of solar energy. In comparison, a cost-based incentive could discourage true cost reductions until a mature, highly competitive market is developed.

Second, a capacity-based incentive rewards new technology that can produce electricity at a lower cost. For example, in Washington DC, the "turn-key" cost for an installed PV system is approximately $6,000/half-kilowatt. If enacted, the improved credit structure in HR 550 would subsidize approximately 25% of the cost of the system. As the market matures and less expensive technologies are deployed, in the form of low cost panels or more cost effective installation technologies, it is anticipated that the installed cost would drop to approximately $4,000/half-kilowatt. The improved credit would then represent 35% of the cost of a system. Cost reductions in technology and installation will then encourage greater numbers of installations, further driving down system costs.

Finally, studies have shown that state programs that incentivize solar technology deployment using a capacity-based rebate program result in larger solar installations than state programs that use a straight cost-based structure. This is especially important when we consider how solar can reduce demand for natural gas fired peak power (the most expensive electricity) and bring lower energy costs to all consumers. Larger initial installations have unique benefits, such as grid stability, avoided consumption of high-priced natural gas, myriad environmental benefits, and job creation throughout the entire economy.

The Energy Security, Energy Independence and Environmental Benefits of Solar

Enactment of HR 550 will improve our energy security, move the US closer toward energy independence, and deliver numerous environmental benefits due to the inherent non-polluting nature of solar energy.

Energy Security

As Congress looks to increase the use of carbon-smart renewable energy, it is critical that priority be placed on technologies that also improve US energy security. Solar energy, in all of its forms, is a technology that can greatly improve the US's ability to have a secure and reliable energy supply.

The electricity infrastructure in the US is aging and energy consumers are increasingly subject to outages that affect critical infrastructure and disrupt business. The black out of August 2003 in the Northeast, triggered by a tree limb landing on power lines, cost consumers and businesses tens of billions of dollars. Unfortunately, this event is not unique and will occur with greater frequency if Congress does not take steps to diversify our energy portfolio.

The good news is that this event could easily have been avoided through greater use of solar energy. A 2004 Department of Energy (DOE) study entitled *Solution to the Summer Blackouts?* concludes that if solar energy had met just one percent (1%) of local peak demand, we would have avoided the August 2003 blackout and other local brownouts. DOE's explanation was simple: high air conditioning loads stressed the grid and caused the blackout. These loads occurred on the hottest and sunniest days during the summer – the exact time when output from solar systems are greatest. DOE also concluded that over reliance on central generating stations led to grid fatigue and failure.

This infrastructure vulnerability could have been minimized through greater reliance on distributed solar energy.

Photovoltaic (PV) and solar water heating systems are distributed generation (DG) technologies. Like other DG technologies, they provide energy at the point of consumption rather than at a central power plant hundreds of miles away. As such, DG does not rely on vulnerable regional transmission lines and local distribution networks. By producing energy at the source of consumption, solar power alleviates stress and vulnerability on the grid.

The DOE study also concluded that investing in solar energy is a more economically efficient and cost effective way to improve our energy infrastructure than capital intensive and often community-opposed transmission line upgrades. In sum, using solar energy is a cost-effective, affordable way to alleviate stress on the electricity grid and improve the overall reliability of our electricity infrastructure.

Solar is also the most reliable source of energy. This reliable track record has resulted in wide deployment of the technology in applications where power interruptions are unacceptable, including: oil and gas industry use of solar energy to power pumps and meters at remote locations; telecommunications industry use of solar to power relay stations and remote equipment; and, every satellite that has been sent out into space in the last 30 years has been powered by solar energy.

Ironically, energy industry acceptance of the technology stands in stark contrast to consumer behavior. Consumers are investing hundreds of millions of dollars in small gasoline-powered generators. During grid failure and electricity outages, electronic gasoline pumps at the gas stations do not operate, rendering many generators idle because of fuel shortage. Solar energy is a technology that can provide reliable power during power outages.

Finally, solar stabilizes volatile energy prices, a critical energy security issue affecting the US today. In the last five years, consumers have seen electricity prices escalate between 20 and 78 percent. At the same time, we have seen the price of natural gas triple and the price of gasoline routinely exceed $3.00 per gallon. Each year the cost of energy is taking a larger percentage of a family's income than at any other time in US history. This energy inflation vulnerability especially impacts the poor and elderly on fixed incomes.

Solar can help address this vulnerability because it requires no fuel to operate. Although a solar system is more expensive up front, there are no additional costs for operating a system once installed. Furthermore, solar panels are guaranteed for 20-25 years, allowing consumers to "lock in" their electricity prices for decades. Recognizing the upward trend in energy costs, incentivizing the use of a technology that requires no fuel inputs is an important element of any energy security plan.

Energy Independence
Solar energy is a domestic and abundant energy source in the US. The US has the best solar resources of any developed country in the world. Proportionally, US solar energy resources exceed those of fossil, nuclear or other renewable energy resources. Despite this tremendous advantage, the US has failed to capture and harness this free and readily available energy. In 2006, solar energy produced just 1/30th of one percent of all electricity in the US; Germany in contrast, with the solar resources of Alaska, installed seven times more solar energy property than the entire US.[2]

Congressional determination to increase energy independence hinges upon its commitment to developing our unlimited domestic solar resources. To accomplish this, Congress must pass an eight year ITC extension, such as that found in HR 550.

Figure 2: Germany Insolation

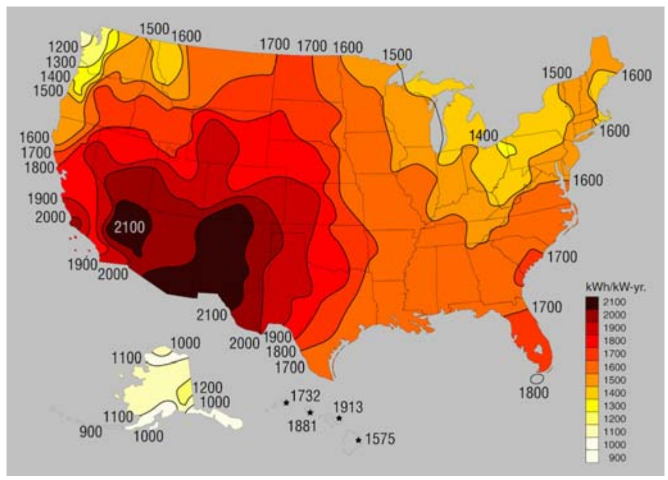

Figure 3: U.S. Insolation

The US is over-dependent on foreign sources of energy. Demand for natural gas continues to rise, primarily for the electricity generation. Increasingly we are turning to countries like Algeria to provide us with liquefied natural gas (LNG) to meet our growing demand. According to the Federal Energy Regulatory Commission, 41 new LNG terminals are proposed for construction in US harbors and off US beaches. Constructing these plants will exacerbate our addiction to foreign sources of energy. Our desire for energy independence demands a different course.

Solar energy directly displaces natural gas used for heating homes and water. In a home, solar can directly replace natural gas used to heat radiant systems and can displace up to 70% of the natural gas used to generate hot water. Many countries that do not have a domestic source of fossil fuels, including Spain and Israel, mandate that all new homes must have solar water heating systems installed. The US can demonstrate similar energy independence by using market incentives that spur solar investment and market growth.

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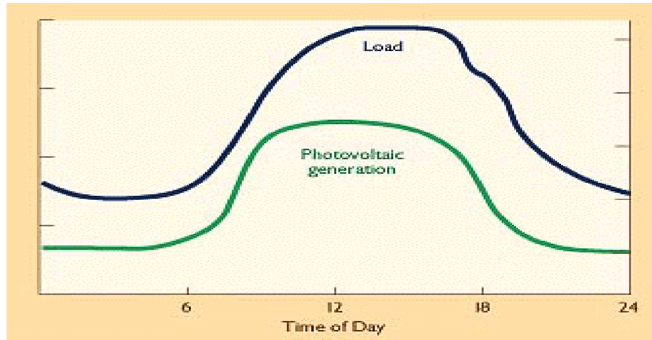
[2] Energy Information Administration, Net Generation by Energy Source by Type of Producer, October 2006.

Solar energy also displaces natural gas used to generate electricity. Almost all intermediate and peaking electricity plants use natural gas as the source of energy. These plants are often very inefficient and produce expensive electricity. Solar energy, which generates electricity from 8 AM – 7 PM daily, can displace these inefficient, high cost power plants, and become a reliable source of firm, dispatchable power.



Utility load and PV output versus time of day.

Given the high price of natural gas to key industrial sectors and consumers, the US can no longer afford to neglect its abundant solar resources. Analysis conducted by the Solar Energy Industries Association concludes that an eight-year extension and expansion of §48 and 25 tax credits for solar energy will displace over 5.5 trillion cubic feet (Tcf) of natural gas, providing an economic value to consumers in excess of $50 billion.[3] This is enough energy to displace the need for all new LNG terminals by 2012.

In addition to tempering natural gas demand growth, solar can also generate electricity to be used by plug-in hybrids and electric vehicles, thereby displacing gasoline derived from foreign oil supplies. Imagine a gasoline-free electric vehicle that also uses electricity derived from the sun rather than a coal-fired plant. The technology is advancing rapidly in this direction, but it is critical that Congress catalyze the market by providing incentives to use solar energy.

Environmental Benefits

Though the environmental benefits of solar energy might be considered a given, it is worth highlighting several points. Solar is the cleanest method of energy generation, in terms of avoided air, waste and noise pollution, energy payback, water conservation, radiation, harm to wildlife, or environmental risk in the event of an accident.

Solar energy produces no greenhouse gases, no acid precipitation or toxic emissions, and no other air pollution of any kind. Over the 40-50 year life of a solar electric system, every kilowatt (kW) of solar electric power reduces 217,000 pounds of carbon dioxide, 1500 pounds of sulfur dioxide, and 830 pounds of nitrogen oxides emissions as compared to electricity produced by conventional generation.[4]

Photovoltaic solar energy generates electricity without use any water. In contrast, fossil fuel and nuclear based electricity generation use substantial amounts of water to run steam turbines. Across the US, approximately 40% of fresh water withdrawals are used

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[3] Solar Energy Industries Association Natural Gas Displacement Model
[4] NREL report, "Distributed Energy Resources for the California Local Government Commission," October 2000.

for electric generation.[5] If water-starved communities like Phoenix and Las Vegas are to continue growing, we must place greater emphasis on water-free electricity generating technologies.

Concerns have been raised whether the energy used to produce solar panels is surpassed by the amount of energy generated from the panels. This energy relationship is referred to as the "energy payback period." Currently, the energy payback for PV panels varies from 1-4 years depending on different manufacturing variables. This means that a PV panel with a life expectancy of 40-50 years will generate between 10 and 50 times more energy than was required to create the panel. Despite this superior "energy return on investment", the manufacturing process is still growing more efficient every year as the scale of production increases.[6]

Conclusions

Solar energy is an obvious choice for a carbon-smart, reliable and domestic energy future. Greater reliance on this untapped energy resource will grow the economy, create jobs, increase grid integrity and security, while heralding energy independence. Unfortunately, all of these benefits are dependent on passage of HR 550. In the absence of long-term Congressional leadership, we will continue down the path of over reliance on foreign, highly price-volatile, insecure, carbon-intensive energy sources.

The US stands at an energy crossroads. Independent, carbon-smart energy choices can be made today that will benefit generations to come. However, the window of opportunity is quickly closing. This Congress has an opportunity to invest in solar energy and ensure that the US reclaims global energy leadership and independence.

In conclusion, passing HR 550, the *Securing America's Energy Independence Act*, is the most meaningful solar policy that Congress could enact this year.

I thank the committee for giving me this opportunity to speak, and I am available to answer any questions you may have.

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[5] Sandia National Laboratories, Energy-Water Nexus, http://www.sandia.gov/news-center/news-releases/2006/environ-waste-mgmt/mapwest.html

[6] NREL Report No. NREL/FS-520-24619: "Energy Payback: Clean Energy from PV"